move toward 1.0 over time, many financial services, such as *Value Line* and Merrill Lynch, adjust their original estimate of a company's beta by the formula:

*Adjusted beta = .66(Estimated beta) + .34(1.0)*

Applying the above formula to the Brattle Group's estimated beta of 1.82 produces an adjusted beta of 1.54.[4] This adjusted beta is a more accurate estimate of the cable companies' beta for the next several years than the Brattle Group's 1.82 estimate. The use of a beta equal to 1.54 would have reduced the Brattle Group's estimate of the cable companies' cost of equity by 238 basis points.

10. The need to adjust estimated betas for their tendency to move toward the mean beta of 1.0 over time arises from the observation that the estimated beta is equal to the true beta plus a random error term with expectation zero:

*Estimated beta = True beta + Random error*

In an oft-quoted paper, Professor M. Blume of the University of Pennsylvania observes that an unusually high or low estimated beta is generally the result of an extreme error added to a somewhat more moderate true beta.[5] Since the random error is expected to be zero in the next period, the estimated beta will tend to overstate the true beta.

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[4] .66(1.82) + .34(1.0) = 1.54. For further information on this adjustment, see William F. Sharpe and Gordon J. Alexander, 1990, *Investments* (4th ed.), Englewood Cliffs, NJ: Prentice Hall, pp. 427-428.

[5] M. E. Blume, "Betas and Their Regression Tendencies", *The Journal of Finance*, June 1975, pp. 785-795.

11. Professor Blume's analysis fits the cable industry quite well over the five-year period the Brattle Group used to estimate their cable industry betas. During this period, the cable industry received a number of random shocks that were unrelated to movements in the general market. For instance, in the week the possible TCI—Bell Atlantic merger was announced, cable industry stock prices increased by 17.95 percent,[6] while the S&P 500 went up by just 2 percent. The merger announcement should not have affected the cable companies' true beta because it was an industry-specific event that was unrelated to market movements.[7] However, the merger announcement did have a dramatic impact on the measured beta, for the increase in cable industry stock prices was approximately 9 times the increase in the S&P 500 during that same week. Other industry-specific events, such as the reduction in cable rates announced April 1, 1993, and March 30, 1994, had a similar impact on the cable companies' estimated beta. These random shocks artificially raised the observed beta, but provide no guidance in estimating the true beta going forward. My studies indicate that the cable companies' estimated beta would decrease approximately 28 basis points, if only 4 weekly observations (out of more than 250), corresponding to specific events in the cable industry unrelated to general market movements, are deleted from the 5-year period studied by the Brattle Group.

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[6] As measured by a market weighted index of the cable stocks studied by the Brattle Group and available in Compustat.

[7] In the language of the CAPM, the risk of industry specific events are "unsystematic" -- the risk that can be eliminated with a fully diversified portfolio. The investor will only be compensated for "systematic" risk -- the market risk that is present even after diversification.

**B. The Brattle Group overstates the cable companies' cost of debt.**

12. The Brattle Group uses the ***current*** S&P yield on long-term bonds of similar risk to the cable companies to estimate the cable companies' cost of debt. For the Brattle Group's cable companies, the current cost of long-term debt averaged 10 percent. The Brattle Group's use of the current cost of long-term debt is inconsistent with the Commission's practice of using the embedded cost of debt to calculate the telephone companies' average cost of capital.

13. Correcting the Brattle Group's estimate using the cable companies' ***embedded*** cost of debt lowers the overall rate of return. Specifically, the cable companies followed by the Brattle Group and available in Compustat have an average embedded cost of long-term debt of approximately 8.31 percent.[8] The cable companies' average embedded cost of debt is less than the current S&P long-term bond yield for their rating category because cable companies have relied heavily on short- and intermediate-term debt to finance their operations, while the S&P bond yield pertains only to long-term debt. The Brattle Group's use of the current S&P yield on long-term bonds of similar rating, rather than the cable companies' average embedded cost of debt, clearly biases their estimate of the cable companies' average cost of capital upward.

[8] See Schedule 1.

### C. The Brattle Group understates the cable companies' leverage.

14. In calculating the weighted average cost of capital, the Brattle Group weights the cost of debt and the cost of equity by the market value percentage of debt and equity in the cable companies' average capital structure. The Brattle Group's use of market values, however, is inconsistent with the Commission's use of book values to measure both cable companies' and telephone companies' capital structures. Since the market value of the cable companies' equity exceeds the book value of their equity by a significant margin, the use of market values understates the cable companies' use of leverage as measured on a traditional basis. The use of understated leverage values produces an overstatement of the cable companies' average cost of capital.

## IV. THE BRATTLE GROUP OVERSTATES THE CABLE COMPANIES' COST OF EQUITY AT A 50—50 CAPITAL STRUCTURE.

### A. The Brattle Group incorrectly assumes that the cost of capital does not depend on the cable companies' capital structures.

15. Recognizing that their cost of equity estimate relates only to the cable companies' actual capital structures, the Brattle Group attempts to adjust their cost of equity so that it will relate to the Commission's proxy capital structure of 50 percent debt and 50 percent equity. In making their adjustment, however, the Brattle Group incorrectly assumes that the cable companies' average cost of capital for a 50—50 capital structure is identical to the cable companies' average cost of capital for their actual capital structures. The Brattle Group's basic assumption that the average cost of capital is

independent of capital structure is inconsistent with the conventional wisdom that the average cost of capital varies with a company's capital structure.

**B. The Brattle Group incorrectly unlevers and relevers the cable companies' betas.**

16. The correct method for obtaining the CAPM estimate of the cost of equity at a 50—50 capital structure is to: 1) use the relationship between beta and the percent debt in the capital structure to obtain an adjusted beta corresponding to a 50—50 capital structure, and 2) use the adjusted beta to obtain the cost of equity that corresponds to a 50—50 capital structure. The Brattle Group correctly reports the formulas for making the beta adjustment in their paper, but they do not implement these equations correctly.[9] When the equations are implemented correctly, the adjusted beta for a 50—50 capital structure is equal to 1.17.[10] Using a beta of 1.17, the

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[9] The Brattle Group errs by arbitrarily assuming a debt beta of .45 for cable companies. (See the Brattle Group report, Appendix B, page 14.) Since bondholders bear much less market risk over their typical holding period than do stockholders, it is standard practice for financial analysts to assume a debt beta of zero. This assumption is consistent with holding a bond to maturity.

[10] According to the formulas shown on the Brattle Group's report, page 13 of Appendix B:

$$\beta_A = \beta_D \times \frac{D}{V} + \beta_E \times \frac{E}{V}$$

$$\beta_E^L = \beta_A \times (1 + \frac{\hat{D}}{E}) - \hat{\beta}_D \times \frac{\hat{D}}{E}$$

With a debt beta of zero, an equity beta of 1.54,
and the capital structure used by the Brattle Group of 38 percent equity,

$\beta_A = 1.54(.38) = .585$

At the target 50-50 capital structure, $\beta_E^L = .585(1 + .5/.5) = 1.17$

Brattle Group would have obtained a cost of equity for a 50—50 capital structure of 13.7 percent.[11]

**C. The cable companies' ECAPM[12] cost of equity is 15.35 percent for a capital structure with 50 percent debt and 50 percent equity.**

17. Since equity is a long-term investment, the yield on long-term Treasury bonds is a more appropriate estimate of the risk-free rate than the yield on short-term Treasury bills. In the Federal Reserve's June 7, 1994, *Statistical Release*, the yield on long-term Treasury bonds is reported as 7.27 percent. The Ibbotson Associates' *1994 Yearbook* reports a risk premium of 7.2 percent on equity compared to long-term Treasury bonds. Using a risk-free rate of 7.27 percent, a beta of 1.17, and a risk premium of 7.2 percent in the ECAPM produces a cost of equity estimate for a 50—50 capital structure equal to 15.35 percent.[13]

**D. Using the Brattle Group's own ECAPM calculation, the cable companies' average cost of capital with a 50—50 capital structure is 11.83 percent.**

18. Using a corrected version of the Brattle Group's own ECAPM calculation, the cable companies' average cost of capital is given by:

$$ACC = 8.31(.5) + 15.35(.5) = 11.83$$

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[11] According to the CAPM formula, 3.74 + 1.17(8.5) = 13.7

[12] The ECAPM is defined by the Brattle Group as an empirical version of the CAPM. The ECAPM includes an adjustment that seeks to take into account empirical investment realities such as personal taxes, transactions costs and dividends.

[13] According to the Brattle Group's ECAPM formula, (7.27 + 2) + 1.17(7.2 - 2) = 15.35.

This 11.83 percent ECAPM estimate of the cable companies' average cost of capital differs from my original estimate of the cable companies' average cost of capital in this docket filed in August 1993 for three reasons. First, my original estimate was based on the cable companies' actual 1992 capital structure rather than a hypothetical 50—50 capital structure. Second, my original estimate was based on a slightly lower cost of debt. Third, my original estimate was based on a slightly lower DCF cost of equity.[14]

## V. THE CABLE COMPANIES' AVERAGE COST OF CAPITAL USING THEIR ACTUAL AVERAGE CAPITAL STRUCTURE IS 9.38 PERCENT.

19. In previous testimony in this docket, I presented an estimate of the cable companies' average cost of capital using their ***actual*** book value capital structures, adjusted for their accumulated losses, and a DCF estimate of the mean cost of equity for the third quartile of the S&P 400. For all the reasons given in my previous testimony, I still believe this approach is appropriate for the cable industry. Updating my studies to reflect more recent data, I have determined that the cable companies' average cost of capital is now 9.38 percent. This estimate is based on a market weighted mean DCF cost of equity for the third quartile equal to 15.44 percent,[15] an embedded

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[14] My cable companies' actual average 1992 capital structure contained 86 percent debt and 14 percent equity. The 1992 average embedded cost of debt for these companies was 7.80 percent. My original DCF estimate of the cable companies cost of equity was 15.11 percent.

[15] See Schedule 2.

cost of debt of 8.31 percent, and a book value capital structure containing 84.93 percent debt and 15.07 percent equity.[16]

20. The Brattle Group misapplies an alternative methodology to calculate a cable industry cost of capital. The result is a recommendation that significantly overstates the industries' actual cost of capital. If accepted by the Commission, this recommendation, would provide the cable industry with an artificial advantage in their competition with the telephone industry.

[16] See Schedule 3.

AFFIDAVIT OF JAMES H. VANDER WEIDE

I, JAMES H. VANDER WEIDE, being duly sworn, depose and say that the foregoing testimony and exhibits are true and correct to the best of my knowledge and belief.

James H. Vander Weide

James H. Vander Weide

Subscribed and sworn to
before me this 29 day
of July 1994.

Notary Public

My Commission Expires Jan 14 1997

# 1993 COST OF DEBT

| Company Name ($ in millions) | ST Debt | LT Debt* | Cap Leases | Int Expense | Embedded Cost of Debt |
|---|---|---|---|---|---|
| Adelphia Commun -CL A | $16.265 | $1,701.613 | $13.201 | $165.868 | 9.58% |
| Cablevision Systems -CL A | $20.216 | $2,215.283 | na | $232.434 | 10.40% |
| Century Commun -CL A | $20.072 | $1,167.423 | $0.000 | $112.294 | 9.46% |
| Comcast Corp -CL A | $264.781 | $4,162.914 | $0.000 | $347.448 | 7.85% |
| Jones Intercable -LP -CL A | $1.109 | $17.291 | $0.630 | $0.979 | 5.14% |
| Jones Intercable Inc. -CL A | $46.000 | $279.986 | $1.228 | $43.573 | 13.32% |
| Jones Spacelink LTD -CL A | $115.000 | $281.479 | na | $47.177 | 11.90% |
| TCA Cable TV Inc. | $25.705 | $117.548 | $0.000 | $10.971 | 7.66% |
| Tele-Communications -CL A | $996.000 | $8,904.000 | $0.000 | $731.000 | 7.38% |
| TOTAL | $1,505.168 | $18,847.537 | $15.059 | $1,691.744 | Wtd. Avg. 8.31% |

*Not including Capital Leases

Assumptions: Capitalized Leases were not reported separately for Cablevision Systems or Jones Spacelink Ltd. They were assumed to be zero. All data is on a calendar year basis.

| | Company | Price | DMd | IBES Mean Growth | DCF Qtrly Result | | |
|---|---|---|---|---|---|---|---|
| 1 | HOME DEPOT INC | $42.08 | $0.12 | 28.40 | 28.79% | Overall Mean | 14.94% |
| 2 | BLOCKBUSTER ENMNT CORP | $26.00 | $0.10 | 26.90 | 27.41% | Overall Med | 14.81% |
| 3 | LOWE'S COS | $33.43 | $0.16 | 23.10 | 23.72% | Overall Mid | |
| 4 | OCCIDENTAL PETROLEUM CORP | $17.33 | $1.00 | 14.30 | 21.40% | Mid Mean | 15.23% |
| 5 | USX-MARATHON GROUP | $17.10 | $0.68 | 15.60 | 20.72% | | |
| 6 | BRUNSWICK CORP | $22.48 | $0.44 | 18.00 | 20.45% | | |
| 7 | WAL-MART STORES | $25.35 | $0.17 | 19.50 | 20.35% | | |
| 8 | UST INC | $26.13 | $1.12 | 14.90 | 20.17% | | |
| 9 | PHILLIPS PETROLEUM CO | $29.61 | $1.12 | 15.40 | 20.09% | | |
| 10 | PEP BOYS-MANNY MOE & JACK | $29.46 | $0.17 | 19.30 | 20.09% | | |
| 11 | PENNZOIL CO | $48.42 | $3.00 | 12.60 | 19.97% | | |
| 12 | COCA-COLA CO | $40.69 | $0.79 | 17.40 | 19.78% | | |
| 13 | U S HEALTHCARE INC | $40.46 | $0.53 | 18.00 | 19.64% | | |
| 14 | MOTOROLA INC | $48.37 | $0.28 | 18.80 | 19.53% | | |
| 15 | GAP INC | $45.63 | $0.48 | 18.10 | 19.41% | | |
| 16 | INTEL CORP | $84.13 | $0.20 | 18.80 | 19.29% | | |
| 17 | NUCOR CORP | $61.92 | $0.18 | 18.80 | 19.26% | | |
| 18 | WENDY'S INTERNATIONAL INC | $17.50 | $0.24 | 17.90 | 19.21% | | |
| 19 | AUTODESK INC | $54.79 | $0.48 | 18.10 | 19.19% | | |
| 20 | ENGELHARD CORP | $27.21 | $0.44 | 17.00 | 19.00% | | |
| 21 | DISNEY (WALT) COMPANY | $43.84 | $0.30 | 18.00 | 18.87% | | |
| 22 | BAKER-HUGHES INC | $18.67 | $0.48 | 15.80 | 18.69% | | |
| 23 | FLEETWOOD ENTERPRISES | $20.88 | $0.50 | 15.70 | 18.63% | | |
| 24 | PERKIN-ELMER CORP | $30.90 | $0.68 | 15.90 | 18.61% | | |
| 25 | PHILIP MORRIS COS INC | $51.98 | $2.76 | 12.20 | 18.60% | | |
| 26 | SCIENTIFIC-ATLANTA INC | $31.31 | $0.12 | 18.10 | 18.58% | | |
| 27 | COMCAST CORP -CL A SPL | $17.58 | $0.09 | 17.70 | 18.39% | | |
| 28 | PFIZER INC | $68.04 | $1.88 | 14.40 | 18.35% | | |
| 29 | WOOLWORTH CORP | $16.54 | $1.16 | 9.90 | 18.24% | | |
| 30 | TJX COMPANIES INC | $26.35 | $0.96 | 15.80 | 18.21% | | |
| 31 | SYSCO CORP | $25.71 | $0.36 | 16.40 | 18.13% | | |
| 32 | MALLINCKRODT GROUP INC | $32.59 | $0.50 | 16.20 | 18.10% | | |
| 33 | NEW YORK TIMES CO -CL A | $26.48 | $0.56 | 15.50 | 18.09% | | |
| 34 | SCHLUMBERGER LTD | $54.90 | $1.20 | 15.40 | 18.08% | | |
| 35 | BROWNING-FERRIS INDS | $27.54 | $0.68 | 15.00 | 18.02% | | |
| 36 | MCDERMOTT INTL INC | $21.27 | $1.00 | 12.30 | 17.96% | | |
| 37 | WMX TECHNOLOGIES INC | $25.17 | $0.60 | 14.60 | 17.81% | | |
| 38 | LIMITED INC | $19.79 | $0.36 | 15.40 | 17.63% | | |
| 39 | GILLETTE CO | $64.65 | $1.00 | 15.70 | 17.58% | | |
| 40 | ALCO STANDARD CORP | $53.42 | $1.00 | 15.30 | 17.58% | | |
| 41 | AMERICAN BARRICK RESOURCE CP | $23.77 | $0.10 | 17.00 | 17.52% | | |
| 42 | HALLIBURTON CO | $30.25 | $1.00 | 13.50 | 17.50% | | |
| 43 | PEPSICO INC | $35.75 | $0.64 | 15.30 | 17.43% | | |
| 44 | SPRINT CORP | $36.00 | $1.00 | 14.00 | 17.37% | | |
| 45 | BLACK & DECKER CORP | $18.79 | $0.40 | 14.60 | 17.28% | | |
| 46 | FOSTER WHEELER CORP | $40.52 | $0.74 | 15.00 | 17.23% | | |
| 47 | DOW CHEMICAL | $63.46 | $2.60 | 12.30 | 17.22% | | |
| 48 | HARCOURT GENERAL INC | $33.78 | $0.60 | 15.00 | 17.16% | | |
| 49 | SCHERING-PLOUGH | $59.71 | $2.04 | 13.00 | 17.12% | | |
| 50 | CHARMING SHOPPES | $11.15 | $0.09 | 16.10 | 17.09% | | |
| 51 | JOSTENS INC | $18.76 | $0.68 | 10.80 | 17.08% | | |
| 52 | BURLINGTON RESOURCES INC | $43.54 | $0.55 | 15.50 | 17.04% | | |
| 53 | BAUSCH & LOMB INC | $47.28 | $0.88 | 14.90 | 17.02% | | |
| 54 | LOUISIANA LAND & EXPLORATION | $38.08 | $1.00 | 13.90 | 17.00% | | |
| 55 | MEDTRONIC INC | $77.48 | $0.68 | 15.90 | 16.97% | | |
| 56 | MATTEL INC | $25.15 | $0.24 | 15.80 | 16.97% | | |
| 57 | TEXAS INSTRUMENTS INC | $76.50 | $0.72 | 15.80 | 16.89% | | |
| 58 | INTL PAPER CO | $37.02 | $1.68 | 13.90 | 16.84% | | |
| 59 | CIRCUIT CITY STORES INC | $19.59 | $0.08 | 16.40 | 16.90% | | |
| 60 | CORNING INC | $31.92 | $0.68 | 14.30 | 16.88% | | |
| 61 | NEWELL COMPANIES | $40.76 | $0.80 | 14.50 | 16.89% | | |
| 62 | MORTON INTL INC | $33.21 | $1.12 | 15.40 | 16.88% | | |
| 63 | ALBERTSON'S INC | $28.48 | $0.44 | 15.00 | 16.88% | | |
| 64 | COLUMBIA/HCA HLTHCR -VTG | $40.54 | $0.12 | 16.50 | 16.88% | | |
| 65 | PALL CORP | $18.38 | $0.37 | 14.10 | 16.84% | | |
| 66 | SERVICE CORP INTERNATIONAL | $25.08 | $0.42 | 14.80 | 16.84% | | |
| 67 | BARD (C.R.) INC | $24.65 | $0.38 | 14.10 | 16.83% | | |
| 68 | AMERADA HESS CORP | $48.38 | $0.80 | 15.30 | 16.81% | | |
| 69 | ASHLAND OIL INC | $40.31 | $1.00 | 13.60 | 16.80% | | |
| 70 | ABBOTT LABORATORIES | $27.88 | $0.76 | 13.50 | 16.79% | | |
| 71 | TIMES MIRROR COMPANY -SER A | $31.76 | $1.08 | 12.70 | 16.79% | | |
| 72 | OSHKOSH B'GOSH INC -CL A | $14.13 | $0.51 | 12.40 | 16.75% | 4th Quartile | |
| 73 | UNION CAMP CORP | $46.04 | $1.56 | 12.50 | 16.68% | Mean | 18.38% |
| 74 | ATLANTIC RICHFIELD CO | $87.88 | $5.50 | 10.00 | 16.65% | Median | 17.63% |
| 75 | COLGATE-PALMOLIVE CO | $69.46 | $1.44 | 13.80 | 16.57% | Mid Mid Mean | 18.68% |
| 76 | OUTBOARD MARINE CORP | $21.63 | $0.40 | 14.30 | 16.54% | | |
| 77 | U S SURGICAL CORP | $18.08 | $0.08 | 16.00 | 16.54% | | |
| 78 | SAFETY-KLEEN CORP | $14.88 | $0.36 | 13.80 | 16.52% | | |
| 79 | MORRISON KNUDSEN CORP | $26.23 | $0.80 | 12.70 | 16.51% | | |
| 80 | BLOCK H & R INC | $43.63 | $1.12 | 13.40 | 16.50% | | |
| 81 | UNOCAL CORP | $26.88 | $0.80 | 12.90 | 16.47% | | |

| | Company | Price | Divd | IBES Mean Growth | DCF Qrtly Result |
|---|---|---|---|---|---|
| 82 | FLUOR CORP | $50.54 | $0.52 | 15.20 | 16.45% |
| 83 | MANOR CARE INC | $27.00 | $0.09 | 16.00 | 16.40% |
| 84 | RUSSELL CORP | $28.71 | $0.40 | 14.70 | 16.39% |
| 85 | VF CORP | $49.62 | $1.28 | 13.30 | 16.39% |
| 86 | TRIBUNE CO | $60.40 | $1.04 | 14.30 | 16.39% |
| 87 | COMPUTER ASSOCIATES INTL INC | $34.25 | $0.14 | 15.60 | 16.30% |
| 88 | TANDY CORP | $38.63 | $0.60 | 14.30 | 16.28% |
| 89 | AVON PRODUCTS | $57.92 | $1.60 | 12.50 | 16.23% |
| 90 | WALGREEN CO | $41.25 | $0.68 | 13.00 | 14.97% |
| 91 | RUBBERMAID INC | $26.92 | $0.45 | 14.20 | 16.22% |
| 92 | DRESSER INDUSTRIES INC | $22.52 | $0.68 | 12.60 | 16.22% |
| 93 | COOPER TIRE & RUBBER | $26.21 | $0.22 | 15.20 | 16.22% |
| 94 | GENERAL MILLS INC | $53.60 | $1.68 | 12.00 | 16.20% |
| 95 | DUN & BRADSTREET CORP | $59.92 | $2.60 | 10.90 | 16.18% |
| 96 | GREAT ATLANTIC & PAC TEA CO | $24.75 | $0.60 | 12.30 | 16.17% |
| 97 | KERR-MCGEE CORP | $44.15 | $1.92 | 12.00 | 16.11% |
| 98 | GREAT LAKES CHEMICAL CORP | $35.73 | $0.39 | 15.40 | 16.10% |
| 99 | INTL FLAVORS & FRAGRANCES | $35.75 | $1.08 | 12.50 | 16.02% |
| 100 | WESTVACO CORP | $31.88 | $1.10 | 11.90 | 16.02% |
| 101 | TYCO INTL INC | $48.54 | $0.40 | 15.00 | 16.00% |
| 102 | JOHNSON CONTROLS INC | $40.06 | $1.44 | 11.70 | 15.89% |
| 103 | BEMIS CO | $22.58 | $0.54 | 13.10 | 15.97% |
| 104 | MCI COMMUNICATIONS | $23.76 | $0.05 | 15.70 | 15.88% |
| 105 | CAMPBELL SOUP CO | $39.21 | $1.12 | 12.50 | 15.92% |
| 106 | AVERY DENNISON CORP | $28.50 | $0.96 | 11.80 | 15.92% |
| 107 | SEARS ROEBUCK & CO | $46.71 | $1.80 | 11.80 | 15.89% |
| 108 | AMERICAN CYANAMID CO | $47.52 | $1.68 | 11.20 | 15.83% |
| 109 | WORTHINGTON INDUSTRIES | $19.44 | $0.40 | 13.20 | 15.67% |
| 110 | DAYTON HUDSON CORP | $75.77 | $1.68 | 13.00 | 15.68% |
| 111 | KAUFMAN & BROAD HOME | $19.63 | $0.30 | 13.60 | 15.64% |
| 112 | SARA LEE CORP | $21.65 | $0.84 | 12.10 | 15.63% |
| 113 | THOMAS & BETTS CORP | $62.88 | $2.24 | 11.40 | 15.63% |
| 114 | PREMARK INTERNATIONAL INC | $74.71 | $1.12 | 13.80 | 15.61% |
| 115 | DOW JONES & CO INC | $38.77 | $0.64 | 13.00 | 15.60% |
| 116 | WRIGLEY (WM) JR CO | $33.08 | $0.63 | 13.60 | 15.59% |
| 117 | FEDERAL PAPER BOARD CO | $22.88 | $1.00 | 10.40 | 15.57% |
| 118 | MCKESSON CORP | $57.33 | $1.88 | 12.50 | 15.48% |
| 119 | MERCK & CO | $30.40 | $1.12 | 11.10 | 15.47% |
| 120 | DELUXE CORP | $28.56 | $1.44 | 9.70 | 15.43% |
| 121 | INTERPUBLIC GROUP OF COS | $30.27 | $0.66 | 13.20 | 15.42% |
| 122 | PROCTER & GAMBLE CO | $84.75 | $1.24 | 12.70 | 15.41% |
| 123 | K MART CORP | $17.15 | $0.88 | 8.60 | 15.39% |
| 124 | ECOLAB INC | $21.52 | $0.44 | 12.50 | 15.35% |
| 125 | MAY DEPARTMENT STORES CO | $41.17 | $1.04 | 12.30 | 15.32% |
| 126 | WEYERHAEUSER CO | $43.15 | $1.20 | 12.00 | 15.32% |
| 127 | MASCO CORP | $30.65 | $0.68 | 12.60 | 15.29% |
| 128 | HEWLETT-PACKARD CO | $60.88 | $1.00 | 13.70 | 15.19% |
| 129 | TENNECO INC | $51.63 | $1.60 | 11.50 | 15.18% |
| 130 | ROYAL DUTCH PET -NY REG | $105.06 | $4.69 | 9.90 | 15.16% |
| 131 | BROWN-FORMAN -CL B | $28.15 | $0.95 | 11.30 | 15.16% |
| 132 | HILTON HOTELS CORP | $58.63 | $1.20 | 12.70 | 15.14% |
| 133 | SHARED MEDICAL SYSTEMS CORP | $26.17 | $0.84 | 11.30 | 15.11% |
| 134 | MELVILLE CORP | $39.02 | $1.52 | 10.50 | 15.10% |
| 135 | DILLARD DEPT STORES -CL A | $33.79 | $0.08 | 14.60 | 15.09% |
| 136 | SNAP-ON INC | $28.10 | $1.08 | 11.60 | 15.08% |
| 137 | COOPER INDUSTRIES INC | $37.38 | $1.32 | 10.90 | 15.08% |
| 138 | MONSANTO CO | $78.16 | $2.52 | 11.30 | 15.08% |
| 139 | PPG INDUSTRIES INC | $74.63 | $2.24 | 11.50 | 15.07% |
| 140 | GIANT FOOD INC -CL A | $22.88 | $0.72 | 11.30 | 15.02% |
| 141 | PIONEER HI-BRED INTERNATIONL | $35.04 | $0.56 | 13.10 | 15.01% |
| 142 | NALCO CHEMICAL CO | $33.88 | $0.96 | 11.60 | 14.99% |
| 143 | GIDDINGS & LEWIS (NOW) | $24.60 | $0.12 | 14.40 | 14.98% |
| 144 | AMP INC | $62.76 | $1.88 | 11.80 | 14.98% |
| 145 | ECHLIN INC | $27.77 | $0.76 | 11.70 | 14.96% |
| 146 | SUPERVALU INC | $38.38 | $0.88 | 11.60 | 14.94% |
| 147 | PRAXAIR INC | $18.48 | $0.28 | 13.10 | 14.91% |
| 148 | GENERAL ELECTRIC CO | $48.09 | $1.44 | 11.40 | 14.88% |
| 149 | AMERICAN GREETINGS -CL A | $28.25 | $0.80 | 12.70 | 14.82% |
| 150 | POTLATCH CORP | $41.71 | $1.56 | 10.40 | 14.81% |
| 151 | CYPRUS AMAX MINERALS CO | $28.77 | $0.80 | 11.50 | 14.80% |
| 152 | AMERICAN BRANDS INCDE | $31.88 | $2.00 | 7.90 | 14.78% |
| 153 | PITNEY BOWES INC | $40.88 | $1.04 | 11.70 | 14.75% |
| 154 | CLOROX CODE | $50.17 | $1.80 | 10.50 | 14.73% |
| 155 | JOHNSON & JOHNSON | $32.48 | $1.16 | 12.10 | 14.73% |
| 156 | AUTOMATIC DATA PROCESSING | $51.48 | $0.52 | 13.50 | 14.71% |
| 157 | GOODYEAR TIRE & RUBBER CO | $40.28 | $0.80 | 12.30 | 14.67% |
| 158 | CONAGRA INC | $27.88 | $0.72 | 11.60 | 14.65% |
| 159 | REEBOK INTERNATIONAL LTD | $31.65 | $0.30 | 13.50 | 14.64% |
| 160 | RITE AID CORP | $19.08 | $0.60 | 10.90 | 14.62% |
| 161 | EASTMAN KODAK CO | $43.67 | $1.60 | 10.30 | 14.62% |
| 162 | MCGRAW-HILL INC | $56.88 | $2.32 | 10.50 | 14.60% |
| 163 | NORDSTROM INC | $41.88 | $0.40 | 13.40 | 14.54% |

| | |
|---|---|
| 3rd Quartile | |
| Mean | 15.65% |
| Median | 15.61% |
| Mkt Wtd Mean | 15.44% |

| | Company | Price | Divid | IBES Mean Growth | DCF Qtrly Result |
|---|---|---|---|---|---|
| 164 | CPC INTERNATIONAL INC | $47.10 | $1.36 | 11.10 | 14.52% |
| 165 | AMOCO CORP | $54.88 | $2.20 | 9.80 | 14.50% |
| 166 | HARLAND (JOHN H.) CO | $22.58 | $0.98 | 9.40 | 14.49% |
| 167 | McDONALDS CORP | $58.60 | $0.43 | 13.60 | 14.48% |
| 168 | DEERE & CO | $79.88 | $2.00 | 11.50 | 14.48% |
| 169 | HARRIS CORP | $45.60 | $1.12 | 11.50 | 14.41% |
| 170 | KELLOGG CO | $50.23 | $1.36 | 11.20 | 14.40% |
| 171 | KIMBERLY-CLARK CORP | $54.67 | $1.76 | 10.60 | 14.40% |
| 172 | SUN INC | $32.25 | $1.60 | 7.90 | 14.39% |
| 173 | CHEVRON CORP | $67.54 | $3.70 | 9.40 | 14.35% |
| 174 | AMERICAN STORES CO-NEW | $25.41 | $0.48 | 12.10 | 14.35% |
| 175 | PHELPS DODGE CORP | $55.00 | $1.65 | 10.60 | 14.34% |
| 176 | PULTE CORP | $27.65 | $0.24 | 13.30 | 14.33% |
| 177 | WHITMAN CORP | $15.50 | $0.30 | 12.00 | 14.30% |
| 178 | AIR PRODUCTS & CHEMICALS INC | $44.00 | $0.92 | 11.80 | 14.28% |
| 179 | WARNER-LAMBERT CO | $65.42 | $2.44 | 9.90 | 14.28% |
| 180 | BRISTOL MYERS SQUIBB | $53.17 | $2.92 | 7.90 | 14.27% |
| 181 | BAXTER INTERNATIONAL INC | $23.31 | $1.00 | 9.20 | 14.21% |
| 182 | MILLIPORE CORP | $47.38 | $0.56 | 12.60 | 14.21% |
| 183 | CENTEX CORP | $30.04 | $0.20 | 13.40 | 14.20% |
| 184 | APPLE COMPUTER INC | $32.25 | $0.48 | 12.40 | 14.17% |
| 185 | HEINZ (H.J.) CO | $33.10 | $1.32 | 9.50 | 14.17% |
| 186 | GANNETT CO | $52.81 | $1.32 | 11.20 | 14.15% |
| 187 | UNILEVER N V -NY SHARES | $107.19 | $3.05 | 10.60 | 14.15% |
| 188 | ILLINOIS TOOL WORKS | $41.00 | $0.92 | 12.60 | 14.11% |
| 189 | TEXACO INC | $54.04 | $3.20 | 8.30 | 14.11% |
| 190 | PARKER-HANNIFIN CORP | $38.56 | $1.00 | 11.10 | 14.09% |
| 191 | SHERWIN-WILLIAMS CO | $31.92 | $0.56 | 12.00 | 14.09% |
| 192 | QUAKER OATS CO | $64.21 | $2.12 | 10.20 | 14.08% |
| 193 | HASBRO INC | $34.48 | $0.28 | 13.10 | 14.07% |
| 194 | PENNEY (J.C.) CO | $53.99 | $1.68 | 10.40 | 14.05% |
| 195 | KNIGHT-RIDDER INC | $58.13 | $1.40 | 11.20 | 14.05% |
| 196 | LIZ CLAIBORNE INC | $23.79 | $0.46 | 11.60 | 14.04% |
| 197 | HERCULES INC | $109.05 | $2.24 | 11.60 | 14.03% |
| 198 | DONNELLEY (R.R.) & SONS CO | $28.46 | $0.56 | 11.70 | 14.03% |
| 199 | MINNESOTA MINING & MFG CO | $50.19 | $1.76 | 9.90 | 14.01% |
| 200 | GRAINGER (W.W.) INC | $53.23 | $0.60 | 12.50 | 14.01% |
| 201 | CATERPILLAR INC | $111.10 | $0.60 | 13.30 | 13.95% |
| 202 | HERSHEY FOODS CORP | $45.63 | $1.20 | 10.60 | 13.90% |
| 203 | XEROX CORP | $68.71 | $3.00 | 10.30 | 13.87% |
| 204 | ST JUDE MEDICAL INC | $26.95 | $0.40 | 12.10 | 13.86% |
| 205 | SPRINGS INDUSTRIES -CL A | $33.58 | $1.20 | 9.70 | 13.84% |
| 206 | AMERICAN HOME PRODUCTS CORP | $58.35 | $2.92 | 8.00 | 13.80% |
| 207 | WINN-DIXIE STORES INC | $50.38 | $1.44 | 10.40 | 13.78% |
| 208 | CBS INC | $269.28 | $2.00 | 12.60 | 13.71% |
| 209 | INGERSOLL-RAND CO | $35.94 | $0.70 | 11.40 | 13.70% |
| 210 | LOUISIANA-PACIFIC CORP | $35.42 | $0.50 | 12.00 | 13.67% |
| 211 | HANDLEMAN CO | $11.00 | $0.44 | 9.00 | 13.66% |
| 212 | ANHEUSER-BUSCH COS INC | $52.44 | $1.44 | 10.40 | 13.63% |
| 213 | MEAD CORP | $42.21 | $1.00 | 10.80 | 13.59% |
| 214 | DIAL CORP/DE | $44.40 | $1.20 | 10.40 | 13.57% |
| 215 | PACCAR INC | $52.48 | $1.67 | 9.40 | 13.56% |
| 216 | NEWMONT MINING CORP | $42.08 | $0.48 | 12.20 | 13.55% |
| 217 | AT&T CORP | $52.69 | $1.32 | 10.60 | 13.55% |
| 218 | GRACE (W.R.) & CO | $41.67 | $1.40 | 9.80 | 13.53% |
| 219 | NIKE INC -CL B | $55.79 | $0.60 | 11.60 | 13.50% |
| 220 | EMERSON ELECTRIC CO | $68.73 | $1.56 | 10.40 | 13.47% |
| 221 | HONEYWELL INC | $52.75 | $0.66 | 10.00 | 13.43% |
| 222 | GENUINE PARTS CO | $38.23 | $1.15 | 9.60 | 13.41% |
| 223 | TIME WARNER INC | $38.35 | $0.35 | 12.30 | 13.41% |
| 224 | FLEMING COMPANIES INC | $24.90 | $1.20 | 7.60 | 13.37% |
| 225 | LUBYS CAFETERIAS INC | $23.71 | $0.60 | 10.40 | 13.37% |
| 226 | UNITED TECHNOLOGIES CORP | $64.58 | $1.60 | 10.10 | 13.37% |
| 227 | CAPITAL CITIES/ABC INC | $709.38 | $0.20 | 13.30 | 13.33% |
| 228 | EXXON CORP | $62.52 | $2.68 | 8.00 | 13.33% |
| 229 | ALLIEDSIGNAL INC | $35.91 | $0.67 | 11.10 | 13.30% |
| 230 | POLAROID CORP | $31.52 | $0.60 | 11.00 | 13.24% |
| 231 | WHIRLPOOL CORP | $58.31 | $1.22 | 10.60 | 13.22% |
| 232 | MOBIL CORP | $78.00 | $3.40 | 8.10 | 13.16% |
| 233 | BRUNOS INC | $7.77 | $0.24 | 9.50 | 13.10% |
| 234 | STANLEY WORKS | $38.23 | $1.35 | 9.00 | 13.09% |
| 235 | GENERAL SIGNAL CORP | $32.84 | $0.80 | 9.60 | 12.89% |
| 236 | NATIONAL SERVICE INDS INC | $26.23 | $1.08 | 8.20 | 12.87% |
| 237 | TRINOVA CORP | $36.60 | $0.68 | 10.70 | 12.68% |
| 238 | CINCINNATI MILACRON INC | $21.92 | $0.36 | 11.00 | 12.59% |
| 239 | TIMPLIS-INLAND INC | $47.56 | $1.00 | 10.40 | 12.66% |
| 240 | DOVER CORP | $48.38 | $0.92 | 11.00 | 12.65% |
| 241 | ROHM & HAAS CO | $57.44 | $1.40 | 10.00 | 12.65% |
| 242 | EATON CORP | $55.73 | $1.20 | 10.30 | 12.62% |
| 243 | DU PONT (E.I.) DE NEMOURS | $56.77 | $1.76 | 9.20 | 12.61% |
| 244 | TRW INC | $57.40 | $1.68 | 9.50 | 12.75% |
| 245 | PST INC | $17.73 | $0.32 | 10.60 | 12.72% |

| | |
|---|---|
| 2nd Quartile | |
| Mean | 14.11% |
| Median | 14.11% |
| Mid Wtd Mean | 14.11% |

| | Company | Price | Divid | IBES Mean Growth | DCF Qtrly Result |
|---|---|---|---|---|---|
| 246 | JAMES RIVER CORP OF VIRGINIA | $17.46 | $0.60 | 8.70 | 12.69% |
| 247 | ITT CORP | $97.02 | $1.98 | 10.00 | 12.65% |
| 248 | TEKTRONIX INC | $29.98 | $0.60 | 10.30 | 12.64% |
| 249 | DANA CORP | $56.23 | $1.68 | 9.10 | 12.57% |
| 250 | SEAGRAM CO LTD | $28.92 | $0.56 | 10.30 | 12.57% |
| 251 | BECTON DICKINSON & CO | $37.92 | $0.74 | 10.20 | 12.48% |
| 252 | BOEING CO | $45.21 | $1.00 | 9.50 | 12.46% |
| 253 | MERCANTILE STORES CO INC | $37.77 | $1.02 | 9.50 | 12.44% |
| 254 | TEXTRON INC | $54.21 | $1.40 | 9.40 | 12.40% |
| 255 | ALBERTO-CULVER CO -CL B | $21.31 | $0.28 | 10.60 | 12.34% |
| 256 | COORS (ADOLPH) -CL B | $18.71 | $0.50 | 9.20 | 12.30% |
| 257 | UNION CARBIDE CORP | $25.19 | $0.75 | 8.60 | 12.25% |
| 258 | SYNTEX CORP | $17.35 | $1.04 | 5.30 | 12.10% |
| 259 | E-SYSTEMS INC | $42.40 | $1.20 | 8.60 | 12.08% |
| 260 | EASTMAN CHEMICAL CO | $43.15 | $1.60 | 7.60 | 12.07% |
| 261 | GEORGIA-PACIFIC CORP | $69.13 | $1.60 | 9.10 | 12.04% |
| 262 | LILLY (ELI) & CO | $51.75 | $2.50 | 6.50 | 12.02% |
| 263 | GERBER PRODUCTS CO | $34.15 | $0.68 | 9.00 | 11.92% |
| 264 | RALSTON PURINA GROUP | $38.63 | $1.20 | 8.50 | 11.87% |
| 265 | HARNISCHFEGER INDUSTRIES INC | $21.52 | $0.40 | 9.70 | 11.85% |
| 266 | SPX CORP | $15.58 | $0.40 | 8.60 | 11.77% |
| 267 | ALUMINUM CO OF AMERICA | $71.10 | $1.60 | 9.10 | 11.71% |
| 268 | FORD MOTOR CO | $69.35 | $1.80 | 8.20 | 11.70% |
| 269 | ARCHER-DANIELS-MIDLAND CO | $23.63 | $0.10 | 11.20 | 11.69% |
| 270 | PLACER DOME INC | $22.46 | $0.26 | 10.30 | 11.65% |
| 271 | BALL CORP | $28.65 | $0.60 | 9.00 | 11.61% |
| 272 | ROCKWELL INTL CORP | $38.73 | $1.00 | 8.60 | 11.58% |
| 273 | NORTHERN TELECOM LTD | $28.29 | $0.36 | 10.00 | 11.43% |
| 274 | REYNOLDS METALS CO | $48.13 | $1.00 | 8.50 | 11.41% |
| 275 | LORAL CORP | $37.67 | $0.56 | 8.60 | 11.39% |
| 276 | SCOTT PAPER CO | $43.05 | $0.80 | 9.10 | 11.25% |
| 277 | GENERAL DYNAMICS CORP | $42.28 | $2.40 | 4.60 | 11.20% |
| 278 | CUMMINS ENGINE | $48.10 | $0.50 | 9.90 | 11.16% |
| 279 | ARMSTRONG WORLD INDS INC | $53.46 | $1.28 | 8.40 | 11.16% |
| 280 | WESTINGHOUSE ELECTRIC CORP | $12.29 | $0.20 | 9.20 | 11.08% |
| 281 | INTL BUSINESS MACHINES CORP | $56.92 | $1.00 | 9.00 | 11.03% |
| 282 | CHRYSLER CORP | $50.79 | $0.60 | 9.20 | 11.02% |
| 283 | ALLERGAN INC | $21.92 | $0.40 | 8.70 | 10.80% |
| 284 | LONG DRUG STORES INC | $33.99 | $1.12 | 7.00 | 10.78% |
| 285 | RAYTHEON CO | $53.95 | $1.40 | 8.20 | 10.71% |
| 286 | UPJOHN CO | $28.46 | $1.48 | 4.60 | 10.69% |
| 287 | MAYTAG CORP | $16.58 | $0.50 | 7.30 | 10.37% |
| 288 | LOCKHEED CORP | $82.61 | $2.28 | 6.20 | 10.32% |
| 289 | USX-U S STEEL GROUP | $35.95 | $1.00 | 7.00 | 10.20% |
| 290 | MCDONNELL DOUGLAS CORP | $113.88 | $1.40 | 6.70 | 10.11% |
| 291 | INCO LTD | $24.42 | $0.40 | 6.10 | 9.98% |
| 292 | BORDEN INC | $13.38 | $0.30 | 7.20 | 9.75% |
| 293 | MARTIN MARIETTA CORP | $48.94 | $0.90 | 7.20 | 9.53% |
| 294 | GENERAL MOTORS CORP | $56.27 | $0.80 | 7.70 | 9.32% |
| 295 | NORTHROP GRUMMAN CORP | $38.15 | $1.60 | 4.70 | 9.26% |
| 296 | HOMESTAKE MINING | $20.05 | $0.20 | 8.00 | 9.14% |
| 297 | BOISE CASCADE CORP | $32.58 | $0.60 | 5.80 | 8.60% |
| 298 | ALCAN ALUMINUM LTD | $22.29 | $0.30 | 6.80 | 8.42% |
| 299 | ASARCO INC | $24.17 | $0.40 | 6.10 | 7.95% |
| 300 | CHAMPION INTERNATIONAL CORP | $30.05 | $0.20 | 5.40 | 6.14% |

| | |
|---|---|
| 1st Quartile | |
| Mean | 11.69% |
| Median | 11.92% |
| Mid Wid Mean | 11.91% |

Notes:
* Quarterly DCF Model with 5% Flotation
* 3-month average price - March, April and May 1994
* 78 were removed due to lack of information (i.e. no dividends, lack of IBES estimates, etc.)

# CABLE COMPANY CAPITAL STRUCTURES

| Company Name | Ticker | (a) Common Equity 1993 | (b) Retained Earnings 1993 | (c) CEQ - Rel. Earn. 1993 | (d) Total Debt 1993 | (e) Debt Ratio 1993 |
|---|---|---|---|---|---|---|
| Adelphia Commun -CL A | ADLAC | ($868.614) | ($928.879) | $60.265 | $1,731.099 | 96.64% |
| Cablevision Systems -CL A | CVC | ($1,503.201) | ($1,419.900) | ($83.301) | $2,235.499 | 103.87% |
| Century Commun -CL A | CTY | ($215.238) | ($280.499) | $65.261 | $1,187.495 | 94.79% |
| Comcast Corp -CL A SPL | CMCSK | ($870.531) | ($1,739.400) | $868.869 | $4,427.695 | 83.60% |
| Jones Intercable Inc. -CL A | JOINA | $31.649 | ($88.193) | $119.842 | $327.214 | 73.19% |
| Jones Spacelink LTD -CL A | SPLKA | $6.988 | ($38.520) | $45.508 | $396.479 | 89.70% |
| TCA Cable TV Inc. | TCAT | $90.251 | $46.024 | $44.227 | $143.253 | 76.41% |
| Tele-Communications -CL A | TCOMA | $2,112.000 | ($377.000) | $2,489.000 | $9,900.000 | 79.91% |
| TOTAL | | ($1,216.70) | ($4,826.37) | $3,609.67 | $20,348.73 | 84.93% |

Notes:

All data from S&P Compustat
All data on calendar year basis
c = a - b
e = d/(c+d)

**Before the**
**FEDERAL COMMUNICATIONS COMMISSION**
**Washington D.C.**

| | | |
|---|---|---|
| In the matter of | ) | |
| | ) | |
| Implementation of Sections of the Cable Television Consumer Protection and Competition Act of 1992: Rate Regulation | ) | MM Docket No. 93-215 |
| | ) | |
| and | ) | |
| | ) | |
| Adoption of a Uniform Accounting System for Provision of Regulated Cable Service | ) | CS Docket No. 94-28 |

**DECLARATION OF ROBERT G. HARRIS**
**IN SUPPORT OF REPLY COMMENTS OF BELL ATLANTIC**

## A. Qualifications and Purpose of Declaration

1. My name is Robert G. Harris. I am an Associate Professor in the Walter A. Haas School of Business, University of California, Berkeley, and Principal in the Law & Economics Consulting Group. I have presented testimony in this proceeding on the importance of adopting comparable or corresponding regulatory policies toward the cable and local exchange telephone industries as competition between those industries increases. In my earlier testimony, I explained why the Commission should adopt the same conceptual standard for the productivity offset in the cable and LEC price cap plans. In both cases, it is appropriate that future price increases be limited to inflation less a productivity offset, where the offset is set to equal the difference between industry-specific productivity growth and the average growth in productivity for the U.S. economy.

2. This declaration will comment on the use of estimates of total factor productivity (TFP) growth by Christensen Associates (Attachment B to comments of the National Cable Television Association) in setting a productivity offset for the price cap on cable rates. In Section B, I will compare the Christensen study of TFP growth for local exchange carriers, which was based on highly detailed data covering nearly the entire industry, with the Christensen cable industry TFP study, which was based on a very limited set of data. I will explain the nature and effects of the data limitations on the Christensen estimates, and why those results should be adjusted to correct for the data limitations. In Section C., I will explain how the Christensen cable and LEC TFP results should be adjusted to make them comparable. I will show that, if the LEC TFP estimates were based on an output measure comparable to that employed in the cable TFP study, the resulting LEC productivity offset would fall from 1.7% to -.2%. Alternatively, I will show that, if the cable output measure were comparable to the one used in the LEC TFP study, measured cable TFP would increase from -1.9% to +4.4%. Both of these results provide empirical support for my position that the Commission should adopt a productivity offset in cable price caps that is no less than that adopted for the LEC price cap plan.

3. Section D. will respond to the argument of Economists Incorporated that the dramatic increases in cable rates during the 1980's supports the cable industry's argument that there should be no productivity offset in the cable price cap. That argument is based on flawed reasoning and would essentially reward cable companies with higher rates in the future, on the basis of their having raised rates much faster than inflation in the past. The whole point of the Cable Act of 1992 was to prevent cable companies from continuing to raise their prices as they did between 1984 and 1992. Section E is a brief summary of my opinions and recommendations.

## B. The Data Limitations in the Cable TFP Study Bias the Estimates of Cable Productivity Growth Downward

4. Christensen Associates presented its study of historical TFP growth for local exchange carriers in the Commission's LEC price cap review.[1] Christensen estimated historic TFP growth for LECs at 2.6%, which generates a productivity offset of 1.7% for LEC price caps.[2] While Christensen Associates used a similar methodology for estimating TFP growth in the cable industry, there are substantial differences in the two studies. These differences, in sample size, sample bias and measures of output, mean that the results of the two studies are not directly comparable.[3]

5. The Christensen LEC TFP study used data from all seven Regional Bell Holding Companies, GTE and Southern New England Telephone, comprising roughly 93% of all LEC access lines. In contrast, the cable study was based on a data request

> "sent to nine Multiple System Operators...which serve approximately one-half of all cable television subscribers in the United States...Three MSOs, serving 3.7 million subscribers, were able to send us the necessary data. These 3.7 million subscribers represent approximately six percent of all U.S. cable subscribers. Two of the MSOs were able to provide data for the full 1984-1993 period; the third MSO was able to provide data for 1988-1993." (Christensen Cable TFP Study, p. 3).

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[1] Price Cap Performance Review of Local Exchange Carriers, CC Docket No. 94-1, Comments of the United States Telephone Association. Attachment 6, "Productivity of Local Telephone Operating Companies." (Filed May 9, 1994).

[2] The appropriate productivity offset in a price cap plan is the difference between the industry-specific TFP and the TFP for the economy as a whole. Since LEC TFP was estimated at 2.6% and the average TFP for the U.S. economy at .9%, the resulting LEC productivity offset would be 1.7%.

[3] Christensen readily acknolwedges these differences: "While the methodology is the same as that used in the telephone industry TFP studies, its application differs to some degree, due to data limitations." Christensen Associates, " Productivity Growth in the Cable Television Industry," June 1994, page 4.

The results of a TFP study covering 6% of the industry are not comparable to results from a study covering 93%. This must mean that the sample excludes the largest MSOs, TeleCommunications, Inc. and Time-Warner, each of which has more than six percent of all cable subscribers.[4] This would be equivalent to the LECs presenting a productivity study that excluded the seven RBOCs and GTE and included only three small, independent LECs. Were the LECs to present a productivity study based on the historical performance of Centel, United Telephone and Alltel, for example,[5] the FCC would presumably reject the results of that study as inadequate and not indicative of TFP growth in the industry. There are several problems with basing industry-level policy conclusions on historical TFP measured from so small a subset of the industry.

6. First, there is no way to know whether the three responding MSOs experienced more or less rapid TFP growth than other cable firms. I would note, though, that the responding firms are not a random sample of cable operators. Given the nature of the data solicitation process, there could well have been a "self-selection bias," since each firm decided whether or not it would respond to the data request. If the cable operators who have experienced the highest rates of productivity growth chose not report their data to Christensen Associates, the TFP study is based on a biased sample. It is especially troubling that neither of the largest MSOs, TCI or Time-Warner, is included in the sample. If TFP growth were faster for large MSOs than for

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[4] TCI has 11.3 million subscribers, Time-Warner has 6.7 million subscribers. Since the total number of subscribers in the sample is only 3.7miilion, neither is included in the sample. See Television Digest, May 23, 1994, p. 4.

[5] According to the USTA's 1993 Statistics of the Local Exchange Carriers for 1992, the total number of access lines for United Telecom, CENTEL and ALLTEL was approximately 7.1 million access lines or about 5% of the 144.1 million total network access lines in the US.

small MSOs, the Christensen Associates' results would not be representative of the industry. The magnitude of this potential source of bias is quite large. For example, if average input growth for larger MSOs were half the rate of the three MSOs in the study sample, TFP growth for the industry would be about +0.9%, versus the -1.9% reported by Christensen.[6] There is little or no such bias in the LEC TFP study, in contrast, because it was based on the largest U.S. local exchange carriers, comprising 93% of all access lines.[7]

7. Second, because of the small number of firms in the sample, the timing of expenditures and of growth in output is unlikely to be typical of the industry. In the Christensen sample of three MSOs, output and input growth fall from their 1985 rate, rising again in 1988-89. Measured TFP growth falls from 12% to -23% between 1988 and 1989.[8] This period coincides with the addition of data from a third MSO into the sample. which suggests that the reduction in measured TFP is probably not applicable to the cable industry as a whole. Furthermore, in capital-intensive, network-based services like cable and telephone, productivity growth is likely to differ among firms depending on whether the system is under construction and expanding

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[6] Using 1994 subscribership data, about 54 percent of subscribers are served by an MSO having more subscribers than the average of the three MSOs participating in the Cable TFP study: (3.7/3 = 1.23 million). See Cablevision, June 6, 1994, p. 53. TFP growth for this sample would be 3.3 percent (8.5 - (10.3/2)average output growth minus one-half average input growth). A weighted average of the large and small MSOs' TFP growths is then 0.9 percent.

[7] Significantly faster or slower TFP growth for the small telephone companies not covered in the LEC TFP study would not lead to a large bias: if the input growth rate for the small telephone companies omitted from the LEC TFP study were twice the growth rate of those in study, measured LEC TFP would fall from 2.6% to 2.5%, and the correpsonding LEC productivity offset would drop from 1.7% to 1.6%. This adjustment was calculated as follows: input growth for the telephone companies in the TFP study was approximately 0.94% annually, output growth was 3.55% per year. Total Factor Productivity growth was 2.59% for 93% of access lines. The seven percent not included in the TFP study would have, by assumption, 1.86% annual growth in inputs and 1.67% TFP growth (3.55 - (0.94x2)). Weighted TFP growth would then be 2.53% for the entire industry.

[8] Appendix 1 of the Christensen Cable TFP study.

or whether it has reached maturity. In building out a network, the firm incurs high initial increases in inputs because of large expenditures on fixed plant. If accounting followed economic theory, this growth in inputs would be capitalized and spread over the economic life of the assets constructed. However, the high growth of input quantities during the 1985 and 1989 periods suggests that the three particular firms in the sample were undertaking significant construction. Similarly, output growth peaks in 1985-86 and 1988, which is again consistent with the hypothesis that two firms built out their networks in 1985-86 and the third in 1988. Hence, it is highly unlikely that these three firms are typical of the U.S. cable industry.

## C. Adjusting the Cable and LEC TFP Estimates for Comparable Measures of Output and Quality Changes

8. There are two different approaches to measuring output for multi-product firms: (a) physical measures of output growth (subscribers, channels, minutes of use, etc.) weighted together using service revenues as weights, and (b) an index of the quantity of output obtained by subtracting the growth of prices from the growth of revenue for each service and averaging the results, using service revenues as weights. Historical productivity growth estimates using these different approaches to measuring output growth are not likely to be comparable. In addition, both methods of measuring output assume that all relevant aspects of the service are captured either in the physical measurements used or in the revenue and price indices.

9. The Christensen cable TFP study measures industry output as a revenue-weighted average of the number of basic and premium subscribers. In contrast, the Christensen LEC TFP study measures output as revenue from each of the telecommunications services supplied by LECs, deflated to remove the effects of

price changes. Christensen explains his use of "number of subscribers" as the sole measure of cable output as due to data limitations. Estimating TFP growth using the number of subscribers as the sole measure of output omits at least three other significant cable industry outputs that have increased over the period: (a) the number of channels in basic tier and first tier services; (b) overall viewership (as measured in ratings, for example); and (c) advertising. Consider the increase in the number of basic tier channels: in the cable TFP study, the costs of the increase in channels are effectively measured as reductions in productivity. In order to attract the same number of subscribers, all else equal, the cable company would have to use more inputs. The fact that customers valued the additional channels, paid more (and were willing to pay more) for the additional channels is omitted from this measure of the output of a cable system. This represents a significant downward bias in the estimation of TFP.

10. While producing a comparable TFP study for LECs and Cable companies would be difficult because of data limitations, it is straightforward to obtain an estimate of the magnitude of the difference that these two approaches to measuring output can make. First, one can adjust the LEC productivity estimate by using a comparable measure of output to the one used in the cable TFP study. Suppose that the output of LECs were measured by numbers of subscribers. During the 1984-92 period, residential telephone subscribership increased from 79.9 million to 91.0 million households, achieving an annual rate of growth of 1.64%. During approximately the same period, the number of business establishments increased from 5.3 to 7.5 million at an annual rate of growth of 1.61%. In the LEC TFP study, output growth averaged 3.55% per year from 1984-93. Using 1.6% as the annual rate of growth of LEC output would reduce TFP growth in the LEC TFP study from 2.6% per year to

0.7%, with a corresponding reduction in the LEC productivity offset to -.2%. Thus, if one uses a measure of LEC output that is comparable to that used in the cable TFP study, one would conclude that there should be no productivity offset in the price caps of either industry.

11. A second method of making the cable and LEC TFP results comparable is by adjusting the cable results to reflect measures of output that are more comparable to the output measures used in the LEC TFP study. A physical measure of the output of a cable system takes into account the number of subscribers and the qualities of the output to which they subscribe, because the number of subscribers does not, by itself, capture all of the output of a cable company. A system that provides 24 channels in its basic service tier and has 100 subscribers produces more output that another system that also has 100 subscribers but only provides 12 channels in its basic tier. Output for the first system exceeds output for the second because it has twice the number of channels; customers would be willing to pay more for subscribing to the first system. If all channels were equally valued by subscribers, this difference could be accounted for by measuring output as the product of subscribers and channels (subscriber-channels). The average number of active channels grew 8.7% per year, from 29 in 1984 to 56 in 1992.[9] Subscriber-channels thus grew at an annual rate of 14.7% from 1984 through 1992. If the measure of output in the Cable TFP study were adjusted to account for the change in the average number of channels, estimated TFP growth for the cable industry would

[9] The 1984 estimate is from Federal Communications Commission, Report, MM Docket No. 89-600, July 31, 1990, Appendix F, p. 23. The 1992 figure is estimated from data in Cablevision, May 4, 1992 at 20, by taking a weighted average of the midpoints of the reported ranges of channel capacity per system.

increase from -1.9% to +4.4%. [10] After subtracting economy-wide TFP of approximately .9% during that period, that would suggest a cable price cap productivity offset of 3.5%, compared to a 1.7% productivity offset for LECs. Such a result is not only far more comparable than a superficial reading of the two Christensen studies would indicate, it is also consistent with my expectation that the cable productivity offset should, if anything, be higher than the LEC productivity offset.

## D. Dramatic Cable Rate Increases in the 1980's Do Not Support a Zero Productivity Offset in Cable Price Caps for the 1990's

12. In their Attachment C to the Comments of the National Cable Television Association in this proceeding, Economists Incorporated acknowledge that there was a substantial increase in the number of cable channels and quantity of cable programming available to subscribers during the period for which Christensen measured TFP growth for three cable MSOs. This evidence supports my view that the use of subscribers as an output measure strongly biases the estimate of cable productivity growth downward.

13. Economists Incorporated also argue, though, that "the price increases for all forms of competitive franchises were likely the result of improved quality of

[10] In 1984, there were an average 29.0 channels and 37.3 million subscribers for a total of 1081.7 subscriber-channels. In 1993, there were approximately 56.5 channels per system and 57.2 million subscribers for a total of 3231.8 million subscriber-channels. Using subscriber channels as a measure of output translates into an annual output growth rate of 14.7%. Input growth was estimated by the Cable TFP study at 10.33%. Thus TFP growth increases from -1.9% to 4.4% (14.7 - 10.33).